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PROBLEMS FOR SOLUTION.

ALGEBRA.

295. Proposed by CHARLES GILPIN, JR., Philadelphia, Pa.

In the equation $x^3 - ax \pm b = 0$, we have the following relation between the coefficients and the roots: (1) When $a^3/b^2 = 6.75$ there are three real roots, two of which are equal; (2) when $a^3/b^2 < 6.75$ there are two imaginary roots and one real one; and (3) when $a^3/b^2 > 6.75$ there are three real, unequal roots.

296. Proposed by G. B. M. ZERR, A. M., Ph. D., 4243 Girard Avenue, Philahelphia, Pa.

Sum the series, $1 + \frac{1}{6} + \frac{1}{20} + \frac{1}{50} + \frac{1}{105} + \frac{1}{196} + \frac{1}{336} + \ldots$

GEOMETRY.

329. Proposed by JOHN JAMES QUINN, Ph. D., Scottdale, Pa.

1. Determine the equation of the locus of a fixed point in a circle of radius r, rolling along the axis of an upright cylinder of the same radius, while the axis revolves (carrying the circle with it) through an angle equal to the central angle of the rolling circle formed by the radii to the fixed point and the point of contact.
2. Suppose the point projected into the surface of the cylinder.
3. What is the surface generated by the radius of the rolling circle?
4. What is the surface generated by a radius of the cylinder through the moving point?

CALCULUS.

252. Proposed by J. H. MEYER, S. J., Augusta, Ga.

Supposing the arc of a semi-circle to be stretched out into a straight line, and an indefinite number of perpendiculars erected on it, each equal to the versed sine of the corresponding arc; what would be the length of the curve traced out by the tops of the perpendiculars?

253. Proposed by R. D. CARMICHAEL, Anniston, Ala.

Find the maximum number of real points of inflection in each of the quartic curves $y^2 = a\,x^4 \pm x^2 + \beta$, and find the necessary and sufficient relations between a and β for the existence of this number of points of inflection.

MECHANICS.

212. Proposed by W. J. GREENSTREET, M. A., Marling School, Stroud, Eng.

A peg A is vertically d feet above a peg B. A string AD, a feet long, with two equal, jointed rods DC, CB form the whole figure. Discuss the position of equilibrium.

213. Proposed by W. J. GREENSTREET, M. A., Marling School, Stroud, England.

Two unequal, uniform, smoothly hinged rods are placed over a smooth vertical circle. Apply the principle of vertical work to find the condition of equilibrium in terms of the length of each rod, the diameter of the circle and the angle of either rod with the vertical.

NUMBER THEORY AND DIOPHANTINE ANALYSIS.

151. Proposed by E. B. ESCOTT, Ann Arbor, Mich.

In the recurring series, $n=0, 1, 2, 3, 4, 5, 6, 7, \ldots$
$$u_n=3, 0, 2, 3, 2, 5, 5, 7, \ldots$$
where the scale of relation is $u_{n+3}=u_{n+1}+u_n$, prove that u_p is always divisible by p when p is prime. Is the converse true?

AVERAGE AND PROBABILITY.

193. Proposed by J. EDWARD SANDERS, Reinersville, Ohio.

What is the average area of all squares that may be inscribed in a given sector of a circle, a diagonal of the square being parallel to a random line across the sector?

194. Proposed by PROF. R. D. CARMICHAEL, Anniston, Ala.

What is the mean value of the triangle formed by joining three points taken at random on the circumference of a circle?

MISCELLANEOUS.

176. Proposed by WM. E. HEAL, Coffeyville, Kansas.

In Grassman's *Extensive Algebra*, $e_1e_2=-e_2e_1$. If $e_1=e_2$, $e_1^2=-e_1^2$ $=0$. In quaternions, $ij=-ji$, $i^2j=i.ij=ik=-j$, $i^2=-1$. Reconcile these apparently divergent results.

NOTES AND NEWS.

The next Summer meeting of the American Mathematical Society will be held at the University of Illinois during September.

On December 17th occurred the death of Lord Kelvin, one of the greatest mathematicians and physicists of the present age.

On the 7th of November, 1907, occurred the death of Professor J. R. Rand, Professor of Mathematics in Bates College, Lewiston, Me. His successor is George E. Ramsdell.